Skillshort

Self-Study Preparation Pack

CMA INTERMEDIATE

Paper 9: Operations Management and Strategic Management (OMSM)

Mock Test 2 – Full Paper with Model Answers

ICMAI Syllabus 2022 pattern: 100 marks · 3 hours · Section A – 15 MCQs × 2 (compulsory) · Section B – any 5 of Q2–Q8 (14 marks each) · Original Skillshort questions, numericals verified in Python

Time: 3 hours | Max marks: 100 | No negative marking | Model answers follow the paper

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This subject pack has 6 parts

1 Chapter-wise notes

2 Important topics & weightage

3 Past papers: trends & links

4 Mock tests + solutions

5 Chapter practice questions

6 Last-week plan & strategy

Prepared by Skillshort for self-study. Original explanations and questions; not an official ICAI/ICMAI/ICSI publication. Items marked VERIFY should be checked against the latest official material.

Section A – Multiple Choice Questions (30 marks)

Q1. Choose the correct option (2 × 15 = 30).

1. Ship building and aircraft assembly normally use a
(a) Product layout
(b) Process layout
(c) Fixed-position layout
(d) Cellular layout

2. Demand for the last three months was 120, 135 and 150 units. The 3-month moving-average forecast for next month is
(a) 130
(b) 135
(c) 140
(d) 150

3. Design capacity 1,000 units, effective capacity 800 units, actual output 720 units. Efficiency is
(a) 72%
(b) 80%
(c) 90%
(d) 111%

4. Observed time 4 minutes, rating 120%, allowances 10% of normal time. Standard time is
(a) 4.80 min
(b) 5.28 min
(c) 5.20 min
(d) 4.40 min

5. Total task time is 40 minutes and the cycle time is 10 minutes. The theoretical minimum number of workstations is
(a) 3
(b) 4
(c) 5
(d) 10

6. A transportation problem has 4 sources and 5 destinations. A non-degenerate basic feasible solution has
(a) 9 occupied cells
(b) 8 occupied cells
(c) 20 occupied cells
(d) 5 occupied cells

7. In scheduling, a critical ratio greater than 1 means the job is
(a) Behind schedule
(b) On schedule
(c) Ahead of schedule
(d) Cancelled

8. An activity has duration 7 days, earliest start 8 and latest finish 20. Its total float is
(a) 3 days
(b) 5 days
(c) 12 days
(d) 13 days

9. Normal time 10 days at ₹20,000; crash time 7 days at ₹26,000. The cost slope is
(a) ₹600 per day
(b) ₹2,000 per day
(c) ₹2,600 per day
(d) ₹6,000 per day

10. A machine operated 1,000 hours and failed 4 times. Mean time between failures is
(a) 4 hours
(b) 250 hours
(c) 400 hours
(d) 1,000 hours

11. Preventive maintenance is useful mainly in reducing
(a) Inspection staff
(b) Breakdowns and unplanned downtime
(c) Spare-parts inventory to zero
(d) Depreciation

12. Which of the following is NOT one of Porter's generic strategies?

(a) Cost leadership (b) Differentiation
(c) Focus (d) Diversification

13. Launching a new product in an existing market is, in Ansoff's matrix,

(a) Market penetration (b) Market development
(c) Product development (d) Diversification

14. Which is NOT a perspective of the balanced scorecard?

(a) Financial (b) Customer
(c) Competitor (d) Learning and growth

15. Data stored in XML or JSON files with tags but not in tables is

(a) Structured data (b) Semi-structured data
(c) Unstructured data (d) Metadata only

Section A – Answer key with reasons

Q	Ans	Explanation / working
1	(c)	The product is too large to move, so men and machines come to it – **fixed-position layout**.
2	(b)	(120 + 135 + 150) ÷ 3 = **135**.
3	(c)	Efficiency = actual ÷ effective = 720 ÷ 800 = **90%** (utilisation = 720 ÷ 1,000 = 72%).
4	(b)	Normal time = 4 × 1.2 = 4.8; standard time = 4.8 × 1.10 = **5.28 minutes**.
5	(b)	40 ÷ 10 = **4 workstations**.
6	(b)	m + n − 1 = 4 + 5 − 1 = **8**.
7	(c)	CR = time remaining ÷ work remaining; CR > 1 → **ahead of schedule**.
8	(b)	TF = LF − ES − t = 20 − 8 − 7 = **5 days**.
9	(b)	(26,000 − 20,000) ÷ (10 − 7) = **₹2,000 per day**.
10	(b)	MTBF = operating time ÷ failures = 1,000 ÷ 4 = **250 hours**.
11	(b)	Planned servicing reduces **breakdowns and downtime**.
12	(d)	**Diversification** is a corporate growth strategy (Ansoff), not a generic competitive strategy.
13	(c)	New product + existing market = **product development**.
14	(c)	The four perspectives are financial, customer, internal business process and learning and growth – **competitor** is not one.
15	(b)	Tags give some organisation, but there is no fixed tabular schema – **semi-structured**.

Section B – Descriptive Questions (70 marks)

Answer any five of Questions 2 to 8 (14 marks each). Working notes form part of the answer.

Q2 (a) (7 marks). Compare process, product and fixed-position layouts and state the principles of a good layout.

(b) (7 marks). Explain Total Quality Management (TQM) and Deming's PDCA cycle.

Q3 (a) (7 marks). Laser Tech Ltd. bought a machine for ₹2,40,000 and spent ₹10,000 on installation. Maintenance cost and resale value at the end of each year are:

Year	1	2	3	4	5	6
Maintenance (₹)	20,000	25,000	32,000	42,000	55,000	70,000
Resale value (₹)	1,80,000	1,40,000	1,10,000	90,000	75,000	65,000

Find the average annual cost for each year and state when the machine should be replaced.

(b) (7 marks). Monthly demand for a product was 520, 480, 560, 540, 600 and 580 units in months 1–6. Using exponential smoothing with $\alpha = 0.2$ and an initial forecast of 500 units for month 1, find the forecasts for months 2–7 and the mean absolute deviation (MAD) for months 1–6.

Q4 (a) (7 marks). Six jobs pass through machine M1 and then machine M2 (hours):

Job	J1	J2	J3	J4	J5	J6
M1	5	1	9	3	10	6
M2	2	6	7	8	4	5

Find the optimal sequence, the total elapsed time and the idle time on each machine.

(b) (7 marks). Solve graphically: Maximise $Z = 60x + 50y$ subject to $3x + 2y \le 120$ (machine hours), $x + 2y \le 80$ (labour hours), $x \ge 10$ (contract) and $y \ge 0$.

Q5 (a) (7 marks). For the following project, draw the network, find the critical path and compute the total, free and independent floats:

Activity	A	B	C	D	E	F	G
Events	1-2	1-3	2-4	3-4	2-5	4-6	5-6
Days	5	4	6	8	7	5	6

(b) (7 marks). A project has two paths: P → R and Q → S. Data:

Activity	Normal days	Normal cost (₹)	Crash days	Crash cost (₹)
P	6	10,000	4	14,000
Q	8	9,000	6	12,000
R	5	7,000	4	8,500
S	4	6,000	3	8,000

Indirect cost is ₹2,500 per day. Find the optimal project duration and cost.

Q6 (a) (7 marks). Explain Porter's five forces model.

(b) (7 marks). What is SWOT analysis? How does the TOWS matrix convert it into strategies?

Q7 (a) (7 marks). Explain the balanced scorecard and its four perspectives.

(b) (7 marks). Explain Ansoff's product–market growth matrix.

Q8 (a) (7 marks). What is digital transformation? Explain its key drivers and the challenges in implementing it.

(b) (7 marks). What is goal congruence? How can management achieve it through strategic control?

Model Answers – Section B

SOLUTION Q2(a) Layouts and principles

Basis	Process (functional)	Product (line)	Fixed position
Arrangement	Similar machines grouped by function	Machines in sequence of operations	Product stays; men and machines move
Suits	Job and batch production, high variety	Mass production, standard items	Very large or heavy products
Flexibility	High	Low	High
Material handling	High, back-tracking	Low, conveyors	Moving resources to site
WIP and throughput time	High, long	Low, short	Depends on project
Example	Machine shop, hospital	Car assembly, bottling	Ships, aircraft, dams

Principles of a good layout: integration of all factors; minimum movement and distance; smooth flow without back-tracking; cubic space utilisation; safety and worker satisfaction; flexibility for change; ease of supervision (visibility); minimum handling; accessibility for maintenance.

SOLUTION Q2(b) TQM and the PDCA cycle

TQM is an organisation-wide approach in which every employee works continuously to improve processes, products and services so as to meet or exceed **customer** expectations. Its elements: customer focus; **top-management commitment**; **employee involvement** (quality circles, teams); **process approach**; **continuous improvement (kaizen)**; fact-based decisions using statistical tools (control charts, Pareto, cause-and-effect); supplier partnership; and prevention rather than inspection. Benefits: lower cost of quality, fewer defects, higher customer loyalty.

Deming's PDCA cycle:

1. **Plan** – identify the problem, analyse causes and plan a change.
2. **Do** – implement the change on a small scale (trial).
3. **Check (Study)** – measure results against the plan.
4. **Act** – standardise the change if it works, or start the cycle again with a new plan.

The cycle repeats, giving continuous improvement.

SOLUTION Q3(a) Replacement – Laser Tech Ltd.

Cost C = 2,40,000 + 10,000 = **₹2,50,000**.

Year	Cumulative maintenance	C − resale	Total cost	Average annual cost
1	20,000	70,000	90,000	90,000
2	45,000	1,10,000	1,55,000	77,500
3	77,000	1,40,000	2,17,000	72,333
4	1,19,000	1,60,000	2,79,000	**69,750**
5	1,74,000	1,75,000	3,49,000	69,800
6	2,44,000	1,85,000	4,29,000	71,500

The average annual cost is lowest at the end of **year 4 (₹69,750)** → replace the machine after 4 years.

SOLUTION Q3(b) Exponential smoothing and MAD

$F_{t+1} = F_t + 0.2\,(D_t - F_t)$.

Month	Demand	Forecast	Absolute error
1	520	500.00	20.00
2	480	504.00	24.00
3	560	499.20	60.80
4	540	511.36	28.64
5	600	517.09	82.91
6	580	533.67	46.33
7	–	**542.94**	

MAD = 262.68 ÷ 6 = **43.78 units**. The forecast lags a rising trend – a higher α or a trend-adjusted method would track it better.

SOLUTION Q4(a) Johnson's rule

Pick the smallest time each step: J2 (1 on M1) → first; J1 (2 on M2) → last; J4 (3 on M1) → second; J5 (4 on M2) → fifth; J6 (5 on M2) → fourth; J3 → third.

Sequence: J2 – J4 – J3 – J6 – J5 – J1.

Job	M1 in	M1 out	M2 in	M2 out
J2	0	1	1	7
J4	1	4	7	15
J3	4	13	15	22
J6	13	19	22	27
J5	19	29	29	33
J1	29	34	34	36

Total elapsed time = **36 hours**. Idle time: M1 = 36 − 34 = **2 hours** (after the last job); M2 = 1 (start) + 2 (27–29) + 1 (33–34) = **4 hours**.

SOLUTION Q4(b) Graphical LPP

Lines: 3x + 2y = 120 → (40, 0), (0, 60); x + 2y = 80 → (80, 0), (0, 40); x = 10. Intersection of the first two: 2x = 40 → **x = 20, y = 30**. Intersection of x = 10 with x + 2y = 80 → y = 35.

Corner point	Z = 60x + 50y
(10, 0)	600
(40, 0)	2,400
(20, 30)	**2,700**
(10, 35)	2,350

Optimum: **x = 20, y = 30, Z = ₹2,700**. Machine and labour hours are fully used; the contract condition is exceeded by 10 units.

SOLUTION Q5(a) CPM and floats

Earliest event times: E1 = 0, E2 = 5, E3 = 4, E4 = max(5 + 6, 4 + 8) = 12, E5 = 5 + 7 = 12, E6 = max(12 + 5, 12 + 6) = **18**. Latest: L6 = 18, L5 = 12, L4 = 13, L3 = 5, L2 = min(13 − 6, 12 − 7) = 5, L1 = 0.

Activity	t	ES	EF	LS	LF	TF	FF	IF
A 1-2	5	0	5	0	5	0	0	0
B 1-3	4	0	4	1	5	1	0	0
C 2-4	6	5	11	7	13	2	1	1
D 3-4	8	4	12	5	13	1	0	0
E 2-5	7	5	12	5	12	0	0	0
F 4-6	5	12	17	13	18	1	1	0
G 5-6	6	12	18	12	18	0	0	0

Critical path A – E – G = 18 days. TF = LFj − ESi − t; FF = Ej − Ei − t; IF = Ej − Li − t (not below 0).

SOLUTION Q5(b) Crashing

Normal: P–R = 11 days, Q–S = 12 days → duration 12; direct cost 32,000; indirect 30,000; **total ₹62,000**. Cost slopes: P 2,000; Q 1,500; R 1,500; S 2,000.

Step	Action	Duration	Direct	Indirect	Total
0	Normal	12	32,000	30,000	62,000
1	Crash Q by 1 day (cheapest on the only critical path)	11	33,500	27,500	**61,000**
2	Both paths critical – crash Q and R by 1 day (1,500 + 1,500)	10	36,500	25,000	61,500
3	Crash P and S by 1 day (2,000 + 2,000)	9	40,500	22,500	63,000

Step 2 costs ₹3,000 to save ₹2,500 of indirect cost, so it is not worthwhile. **Optimal duration = 11 days, minimum total cost = ₹61,000.** The crash limit is 9 days (Q and S fully crashed).

SOLUTION Q6(a) Porter's five forces

Porter's model explains the **intensity of competition and profitability** of an industry through five forces:

1. **Threat of new entrants** – high when entry barriers (economies of scale, capital needs, brand loyalty, licences, access to channels) are low.
2. **Bargaining power of suppliers** – high when suppliers are few, inputs are unique or switching costs are high.
3. **Bargaining power of buyers** – high when buyers are concentrated, products are standard and switching is easy.
4. **Threat of substitutes** – products from other industries meeting the same need (tea vs coffee, video calls vs air travel).
5. **Rivalry among existing competitors** – intense when there are many equal rivals, slow growth, high fixed costs and low differentiation.

The stronger the forces, the lower the industry's profit potential. Firms use the analysis to position themselves where forces are weakest or to change them (e.g. building switching costs, backward integration).

SOLUTION Q6(b) SWOT and TOWS

SWOT appraises internal **strengths** and **weaknesses** (resources, capabilities, brand, cost position) and external **opportunities** and **threats** (market growth, regulation, technology, competition). It links the internal and external analyses.

TOWS matrix matches them to generate strategies:

	Strengths	Weaknesses
Opportunities	**SO** (maxi-maxi) – use strengths to exploit opportunities	**WO** (mini-maxi) – overcome weaknesses by using opportunities
Threats	**ST** (maxi-mini) – use strengths to counter threats	**WT** (mini-mini) – defensive moves to cut weaknesses and avoid threats

Example – a regional dairy: SO – use the farmer network to launch high-protein products; WT – partner with a logistics firm to fix a weak cold chain against national rivals.

SOLUTION Q7(a) Balanced scorecard

Developed by **Kaplan and Norton**, the balanced scorecard translates strategy into a balanced set of financial and non-financial measures under four perspectives:

Perspective	Question	Measures
Financial	How do we look to shareholders?	ROI, EVA, revenue growth, cost reduction
Customer	How do customers see us?	Market share, satisfaction, retention, on-time delivery
Internal business process	What must we excel at?	Cycle time, defect rate, productivity, new-product time
Learning and growth	Can we continue to improve and create value?	Employee skills, training hours, IT capability, retention

Each perspective has objectives, measures, targets and initiatives linked by cause and effect (learning → better processes → happier customers → financial results). It prevents an over-emphasis on short-term financial results and supports goal congruence.

SOLUTION Q7(b) Ansoff's growth matrix

	Existing products	New products
Existing markets	**Market penetration** – sell more of current products to current customers (price offers, promotion); lowest risk	**Product development** – new or improved products for current customers (new variants, line extensions)
New markets	**Market development** – take current products to new segments or regions (exports, rural markets)	**Diversification** – new products for new markets; related (concentric) or unrelated (conglomerate); highest risk

Risk rises as the firm moves away from what it knows; firms often combine strategies.

SOLUTION Q8(a) Digital transformation

Meaning: the integration of digital technology into **all areas of a business**, changing how it operates and delivers value to customers. It goes beyond **digitisation** (converting analogue to digital) and **digitalisation** (using digital tools in processes); it requires co-ordination across the whole organisation and **culture change**.

Drivers: changing customer expectations (anytime, mobile service); competition from digital-native firms; cloud, mobile, AI, IoT and analytics; data as a strategic asset; need for efficiency and agility; regulation (e-invoicing, digital payments).

Challenges: resistance to change and legacy culture; skill gaps; legacy IT systems; cyber-security and data-privacy risks; high investment and uncertain returns; lack of a clear digital strategy and leadership.

SOLUTION Q8(b) Goal congruence and strategic control

Goal congruence exists when the goals of individuals and departments are aligned with the goals of the organisation as a whole, so that people acting in their own interest also act in the organisation's interest.

Achieving it through strategic control:

- Translate strategy into clear objectives and **key performance indicators** for each responsibility centre (balanced scorecard).
- Use **responsibility accounting** – managers are judged only on what they control.
- Choose measures that avoid dysfunctional behaviour (e.g. residual income or EVA instead of ROI alone).
- Link **rewards and incentives** to organisational results.
- Set appropriate **transfer prices** between divisions.
- Use participative budgeting, communication and a shared culture.
- Monitor through **premise control, implementation control, strategic surveillance and special alert control**, and take corrective action.